Efficient Power Generation (Greenhouse Gas Pollution Prevention [GEP] Project)

Location: Countrywide
Type: Energy-efficiency improvements in electricity generation
Size: Coal-fired stations totaling 20,000 MW capacity
Funding: US$12,000,000, plus unquantified in-country partner contribution
Objective: To improve power-sector management, increase operating efficiencies, and enhance environmental protection.
Duration: 1995–2005
Scale: Rural and urban

Summary

Increased operating efficiencies through the use of advanced technologies at coal-fired power plants generating 20,000 MW are reducing greenhouse gas (GHG) emissions and narrowing the gap between power supply and demand. The project identified the potential for a 2% improvement in heat-rate efficiency. Technologies are being implemented to reduce fuel costs and, consequently, the price of electricity. Efficiency improvements have reduced carbon dioxide (CO_2) emissions by 1,840,000 tons per year.

In-Country Principles That Attracted Nondonor Financing

- Capacity building and informed decision making
- Public access in support of sustainable development and public participation, coordination, and partnerships

Activities that support capacity building and informed decision-making principles, which in turn help attract private financing, have included study tours, demonstration activities, seminars, and participation in international forums and workshops, which help to increase awareness of commercial business practices, competitive energy market operations, and managing private-sector involvement.

A central element of energy-sector reform efforts is increased public knowledge of, and participation in, energy decision making, which has been enhanced by professional training and outreach programs.

Government policies are being modified to support the introduction of clean-coal technologies in electric-power generation to mitigate climate change.

Financing

Total project investment includes US$12,000,000 from United States Agency for International Development (USAID) technical assistance, plus an unspecified amount of in-kind contributions from the Centre for Power Efficiency and Environmental Protection (CENPEEP), established by India's National Thermal Power Corporation Ltd. (NTPC), with assistance from USAID-India.

The Project

The project is designed to reduce the emissions of GHG per unit of electricity generated by improving the efficiency of existing coal-fired power plants and by implementing advanced technologies for future coal-based power plants.

The CENPEEP was established to implement the Efficient Power Generation (EPG) component of the GEP project, which was set up by the Government of India and USAID. CENPEEP is a national resource for assimilating, disseminating, and demonstrating technical know-how in support of improved power-sector management, increased operating efficiencies, and strengthened environmental protection in India.

Advanced technologies have improved power generation efficiency and environmental controls at coal-fired power stations. NTPC and some state electricity boards have been implementing heat-rate improvements in power plants with a combined generating capacity of about 20,000 MW. Increased operating efficiencies reduce the gap between the demand and supply of power, reduce GHG emissions, and improve the reliability of electricity supply to end users.

Long-term sustainability through cost recovery, global climate change mitigation through implementation of the heat-rate

guidelines, and information dissemination are the guiding principles of CENPEEP and its regional centers.

Technical Data

Technologies include boilers, turbines, electrostatic precipitators, high-pressure/intermediate-pressure turbines, condensers, and high-pressure heaters.

New technical initiatives include (1) a mine-mouth coal washery to demonstrate the benefits of using washed coals in pit-head power generation; (2) mine backfilling of coal-derived ash to demonstrate the benefits of large-volume ash utilization and abandoned mine land reclamation for afforestation; (3) evaluation of integrated gasification combined cycle (IGCC) technology for significant thermal efficiency improvements in new coal-based power generation; (4) and regional centers for CENPEEP to expedite heat-rate improvements in additional power plants.

Performance Data

Power plant performance optimization studies are showing significant improvements in efficiency and reductions in CO_2 and particulate emissions. For example, for a 210-MW unit, heat-rate improvement potential identified by optimizing high-pressure/intermediate pressure turbine efficiencies, condenser vacuum, high-pressure heaters, and relative humidity spray is about 100 kcal/kWh. This optimization corresponds to the following annual reductions: 46,000 tons of coal, 60,000 tons of CO_2, and approximately US$135,000 in fuel costs.

The cumulative CO_2 reduction achieved due to all efficiency improvements is about 1,840,000 tons/yr.

Participants and Roles

The CENPEEP provides a self-sustaining mechanism for long-term support of coal-fired power plants for testing and demonstrating efficiency improvements. India's NTPC and USAID-India helped to establish CENPEEP. The US Department of Energy's National Energy Technology Laboratory provides technical assistance and training to CENPEEP.

Partner Contacts

Richard Edwards
US Agency for International Development
American Embassy
Chanakyapuri, New Delhi
110 021 India

S.C. Deo Sharma
CENPEEP/NTPC
R&D Building
A-8A, Sector-24, NOIDA
201301 U.P. India

Doug Jewell
US Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
Morgantown, WV 26507 USA
Phone: 304-289-4720
E-mail: djewel@netl.doe.gov

Dr. Sai Gollakota
Science Applications International Corporation
626 Cochrans Mill Road
Pittsburgh, PA 15236 USA
Phone: 412-386-5717
Fax: 412-386-4604
E-mail: saigollakota@sa.netl.doe.gov